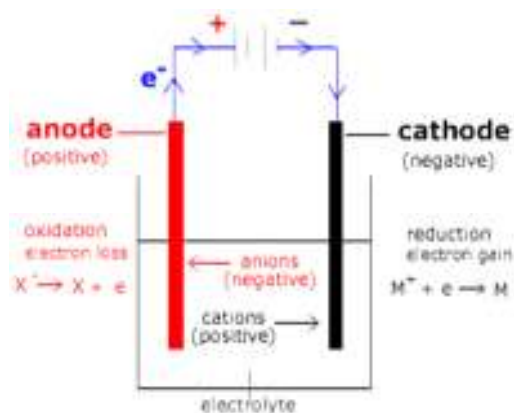


Electrolytic Cells

An electrolytic cell uses electrical energy to produce a chemical change through electrolysis. Electrolysis is where a current is forced through a cell to produce a chemical change. An electrolytic cell can be set up with two compartments, like a galvanic cell, with a power source replacing the voltmeter or it can be set up with just one compartment, as shown below:



Comparison of galvanic and electrolytic cells:

	Galvanic Cells	Electrolytic Cells
Sign of cathode		
Sign of anode		
Sign of E°_{cell}		
Spontaneity		

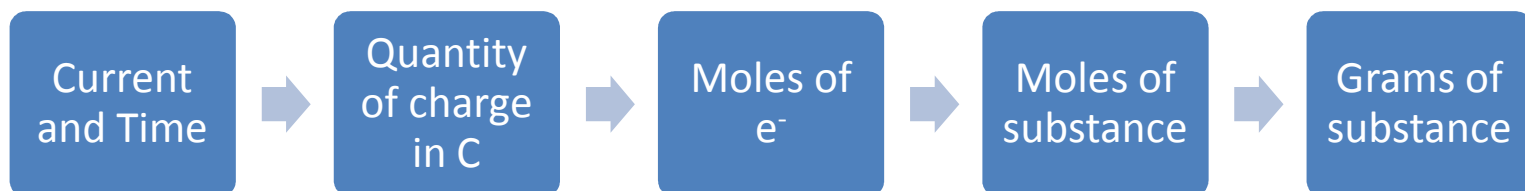
Since electrolysis is a chemical process, we can determine how much chemical change occurs with the flow of a given current for a specified time. Types of questions that could be asked include:

- How much metal was plated or formed
- How long an electroplating process will take
- How much current is required to produce a specified amount of metal over a period of time

These types of questions can be solved through stoichiometry. However, there are some new forms of units that you need to be familiar with:

- Ampere (A) = 1 C/s
- Coulombs (C) = A x s
- Faraday's constant: 96,485 C = 1 mol of e^-

Below is a suggested setup of solving these stoichiometric problems:



Example #1

How long must a current of 5.00 A be applied to a solution of Ag^+ to produce 10.5 g silver metal?

Practice Problems

Work these problems on a separate sheet of paper.

- 1) The electrolysis of BiO^+ produces pure bismuth. How long would it take to produce 10.0 g of Bi by electrolysis of a BiO^+ solution using a current of 25.0 A?
- 2) Aluminum is produced commercially by the electrolysis of Al_2O_3 in the presence of a molten salt. If a plant has a continuous capacity of 1 million amp, what mass of aluminum can be produced in 2.00 h?
- 3) (a) A Cr^{3+} solution is electrolyzed, using a current of 7.60 A. What mass of Cr is plated out after 2.00 days?
(b) What amperage is required to plate out 0.250 mol Cr from a Cr^{3+} solution in a period of 8.00 h?
- 4) Metallic magnesium can be made by the electrolysis of molten $MgCl_2$.
(a) What mass of Mg is formed by passing a current of 4.55 A through molten $MgCl_2$ for 4.50 days?
(b) How many minutes are needed to plate out 25.00 g from molten $MgCl_2$ using 3.50 A of current?